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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/536,993

05/31/2005

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8017-1169

9950

466 7590 03/28/2008

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EXAMINER

CRUZ, LESLIE PILAR

ART UNIT

PAPER NUMBER

2826

MAIL DATE

DELIVERY MODE

03/28/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<p align="center"><b>Advisory Action</b> <b>Before the Filing of an Appeal Brief</b></p>	<p><b>Application No.</b> 10/536,993</p>	<p><b>Applicant(s)</b> SAKAMOTO ET AL.</p>	
	<p><b>Examiner</b> Leslie P. Cruz</p>	<p><b>Art Unit</b> 2826</p>	

**--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

THE REPLY FILED 05 March 2008 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

- a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.  
b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on \_\_\_\_\_. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

#### AMENDMENTS

3. ☐ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because  
(a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);  
(b) ☐ They raise the issue of new matter (see NOTE below);  
(c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or  
(d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: \_\_\_\_\_. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).  
5. ☐ Applicant's reply has overcome the following rejection(s): \_\_\_\_\_.  
6. ☐ Newly proposed or amended claim(s) \_\_\_\_\_ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).  
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.  
The status of the claim(s) is (or will be) as follows:  
Claim(s) allowed: \_\_\_\_\_.  
Claim(s) objected to: 28,29.  
Claim(s) rejected: 1-8,20,21 and 27.  
Claim(s) withdrawn from consideration: \_\_\_\_\_.

#### AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).  
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).  
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

#### REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:  
See Continuation Sheet.  
12. ☒ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). 12/14/2007  
13. ☐ Other: \_\_\_\_\_.

/Minh-Loan T. Tran/  
Primary Examiner  
Art Unit 2826

Continuation of 11. does NOT place the application in condition for allowance because: With respect to claim 1, Applicants argue that neither Haase or Dubin et al., individually or in combination, teaches or suggests a connection plug defined by a via hole filled with a metal comprising a nanomaterial surrounded by the metal, wherein the nanomaterial is substantially uniformly disposed in a section of the via hole, and the metal both surrounds the nanomaterial and fills the via hole. Applicants also argue that Haase teaches a via hole comprised entirely of nanotubes densely packed together, that Haase teaches a particular embodiment wherein a via is filled with hexagonally packed, multi-walled carbon nanotubes and does not teach or suggest a via hole filled with a metal comprising a nanomaterial surrounded by the metal, as required by claim 1. Applicants further argue Haase and Dubin et al., individually or in combination, make no teaching or suggestion that barrier material 34b i) comprises a nanomaterial surrounded by the metal and ii) both surrounds the nanomaterial and fills the via hole 24, as required by claim 1. However, paragraph 0021 of Haase (Figs. 1 & 2) discloses "barrier material 34b may be deposited such that it substantially surrounds second ends 48 of carbon nanotubes 32 whose second ends 48 of carbon nanotubes nanotubes 32 whose second ends 48 do not project out of via 24". Paragraph 0021 of Haase further discloses "barrier material 34b may include tantalum nitride or any other material suitable for substantially preventing seepage of conductive material 34a into dielectric 26" and that layer 34 is conductive. Dubin et al. (Fig. 1) teaches it is well known for a metal such as tantalum to be used as a barrier material between a copper wire 16 and a dielectric layer 12. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the conductive barrier material of Haase to be a metal, such as taught by Dubin et al., in order to improve the adhesion of copper [34a of Haase] to dielectric layer [26 of Haase]. Figs. 1 and 2 and paragraph 0021 of Haase discloses the barrier material 34b partially fills via 24, surrounds the carbon nanotubes 32 and mixes with the second ends 48 of carbon nanotubes 32. Because claim 1 does not specify the via hole is filled with a metal, for example, from the surface of the particles of metal 15 and exceeding the top of interlayer dielectric film 12 as shown in Applicants' Figs. 1-9, it is not patentably distinguishable over the Haase in view of Dubin et al. reference.

With respect to claim 2, Applicants submit that claim 2 is patentable by the same reasoning set forth above pertaining to claim 1. Applicants argue neither Haase or Dubin et al., individually or in combination, teaches or suggests an interconnection comprising a metal layer filling a trench and nanotubes mixed in the metal layer as required by claim 2. However, as set forth above, Figs. 1 & 2 and paragraph 0021 of Haase discloses an interconnection 40 comprising a conductive barrier material 34b filling a via 24 and nanotubes 32, 48 mixed in the barrier material. Haase does not specify the conductive barrier material 34b is a metal. However, Dubin et al. (Fig. 1) teaches it is well known for a metal such as tantalum to be used as a barrier material between a copper wire 16 and a dielectric layer 12. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the conductive barrier material of Haase to be a metal, such as taught by Dubin et al., in order to improve the adhesion of copper [34a of Haase] to dielectric layer [26 of Haase]. Figs. 1 and 2 and paragraph 0021 of Haase discloses the barrier material 34b partially fills via 24, surrounds the carbon nanotubes 32 and mixes with the second ends 48 of carbon nanotubes 32. Because claim 2 does not specify the via hole is filled with a metal, for example, from the surface of the particles of metal 15 and exceeding the top of interlayer dielectric film 12 as shown in Applicants' Figs. 1-9, it is not patentably distinguishable over the Haase in view of Dubin et al. reference.

With respect to claim 27, Applicants argue that neither Haase nor Dubin et al., individually or in combination, teaches or suggests a metal layer filling a trench and a barrier metal layer coating a bottom and sides of the trench where the barrier metal layer is located intermediate the metal layer and the dielectric film with the barrier metal layer separating the metal layer from the dielectric film, particles of metal on a lower horizontal surface of the barrier metal layer, and carbon nanotubes formed on the metal particles and mixed in the metal layer, as recited by claim 27. Applicants further argue Haase teaches a barrier layer incidentally forming along the walls of the trench, the barrier layer is silicon carbide which is not a metal as required by claim 27, and Haase makes no teaching of this incidental barrier layer coating the bottom of the trench in addition to the sides. However, Figs. 1 & 2, paragraph 0015 and paragraph 0022 of Haase teaches "active region 22 may include a thin layer 30 of tungsten or other suitable conductive material" and a barrier material is formed along the walls. Haase does not specify the barrier material is a metal or that a tungsten is a barrier metal layer. However, Fig. 1 and column 1 lines 31-39 of Dubin et al. teaches it is well known for tungsten to be used as a barrier material between a copper wire 16 and a dielectric layer 12 and for a metal to be used as a barrier material. Also, as stated above with respect to claims 1 and 2, the barrier layer 34b of Haase partially fills via 24, surrounds the carbon nanotubes 32 and mixes with the second ends 48 of carbon nanotubes 32. Furthermore, the barrier material of Haase is located along the sidewalls of the via 24 and is therefore intermediate the barrier material 34b and the interlayer dielectric film 26 with the barrier metal layer separating the barrier material 34b from the dielectric film 26. Additionally, Fig. 1 of Dubin et al. teaches it is well known for a diffusion barrier 14 to be intermediate a metal 16 and dielectric layer 12. Because claim 27 does not specify the via hole is filled with a metal layer, for example, from the surface of the particles of metal 15 and exceeding the top of interlayer dielectric film 12 as shown in Applicants' Figs. 1-9, it is not patentably distinguishable over the Haase in view of Dubin et al. reference.

Although claims 1, 2 and 27 recite a metal fills a via hole, a metal layer filling the trench, and a metal layer filling the trench, respectfully, the claims does not recite the via hole or trench is filled with a metal layer, for example, from the surface of the particles of metal 15 and exceeding the top of interlayer dielectric film 12 as shown in Applicants' Figs. 1-9. As another example, a glass may be partially filled halfway with water. Although the claims are interpreted in light of the specification, limitations from the specification (i.e. the via hole or trench is filled with a metal layer, for example, from the surface of the particles of metal 15 and exceeding the top of interlayer dielectric film 12 as shown in Applicants' Figs. 1-9) are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993)..